Accuracy of ECG Interpretations by Emergency Medicine Residents and the Efficacy of Immediate Feedback by EM Attendings

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Introduction

The American College of Emergency Physicians/Association of American Medical Colleges has published guidelines stating that patients presenting to the emergency department with a chief complaint of chest pain should receive a 12-lead ECG within 10 minutes (2). While the speed at which an ECG is obtained is an important factor in determining further diagnostic evaluations and therapeutic plans, proper interpretation of the ECG is critical.

- Studies have found that ECG interpretation skills among internal medicine, family practice, and emergency medicine residents are suboptimal.
- Berger, et al., found that among 87 EM residents and 33 EM residents that nearly 60% of residents incorrectly diagnosed complete heart blocks, and 42% of the residents felt their training in ECG’s was insufficient. The authors concluded that there was a need to “find optimal methods to improve electrocardiography competency.”

The objective of this study was to determine the efficacy of an immediate feedback loop program in ECG readings among residents and attendings while working in a busy academic, urban ED.

Methods

This IRB approved prospective observational study consisted of a convenience sample of residents, attendings, and patients. Data was collected in the ED ICU area on Tuesdays, Wednesdays, and Fridays during all 3 shifts (7a-3p, 3p-11p, and 11p-7a).

Once patients were admitted to the Adult ED ICU area, and required an ECG per physician or nurse order as part of standard of care, on data collection days:

1. ECG technician printed 2 copies of the patient’s ECG.
2. One ECG was stamped as “research copy” the other was placed in the patient’s chart per standard protocol. The ECG technician then stapled the data collection sheet to the research copy of the ECG and it was given to the resident.
3. The resident then read the ECG as per standard of care and marked on the sheet his/her interpretation. The resident then took the ECG to the attending for him/her to read and mark the ECG. The attending was to take time to discuss with the resident his/her agreement or disagreement with the resident’s interpretation and then provide constructive feedback to the resident.
4. Completed ECG’s were placed in data collection boxes for research assistants (RAs) to collect and enter data into Excel. All patient identifiers were blacked out to blind physicians.

A set of ED physicians then served as the QA ECG readers and marked their interpretation of the ECG, and finally, the RAs recorded the Cardiologists’ read.

Data collected included: DOB, age, gender, date and time of visit, chief complaint, differential dx, and performance of the ECG with results. Data collected on the resident included: doctor number, and training year. Data collected on the attending included: physician name, specialty, and years in practice.

Results

Demographic Data of Patients:

- Age (n=298):
  - 17.4% of patients were between the age of 20 and 40 years
  - 76.2% were between 41 and 70 years
  - 6.4% were 71 years and older
- Gender (n=300):
  - Almost evenly split between males (46.6%) and females (53.3%)
- Race (n=300):
  - Most were African American (35%) with 38% White, and 3% reporting as other

EM Physician Participants:

- EM PGY1s read 31% of the cases, EM PGY2s read 24%, and PGY3s read 45%
- EM Attendings agreed with residents’ EKG readings 86% of the time (n=287)
- Cardiologists agreed with EM residents’ EKG readings 71% of the time; leaving 29% disagreement between Cardiologist readings and EM resident interpretations (n=278)
- No. of Cardiologist Disagreements (N = Total No. of EKGs)
  - 1st yr resident on 13% of the ECGs
  - 2nd yr resident on 29% of the ECGs
  - 3rd yr resident on 35% of the ECGs
  - 3rd yr resident on 1% of the ECGs

Resident Survey in Regard to the Feedback Loop and QA System (n=16):

- On an agreement Likert Scale of Sa=Strongly Agree, A=Agree, N=Neutral, D=Disagree, and SD=Strongly Disagree:
  - 50% Agreed that their interpretation skills improved with the QA system, however, 31% Neutral and 13% Disagreed
  - 44% Agreed that the QA system increased their confidence in reading ECGs, however, 38% were Neutral, and 13% Disagreed
  - 57% Strongly Agreed or Agreed that the QA system would assist in providing better patient outcomes, with 38% Neutral
  - In regard to barriers to implementing the system, 14 residents completed this section with the majority expressing that time and the fact that the ED was busy interfered with immediate feedback, but most did not offer suggestions for improvement

Conclusion

The agreements vs. disagreements between the resident, attendings, and cardiologist show a positive trend toward the level of accuracy of ECG interpretations with increasing level of training which signifies the appropriateness of the medical education received by the residents. However, there is a clear discrepancy between the physician and the attending agreement on resident interpretations which is concerning. This may not be of consequential importance.

In reviewing the Feedback loop and the QA system, nearly half of the residents agreed that the QA system increased their level of confidence while interpreting ECGs; however, almost a similar percentage had no opinion about the system or disagreed to its usefulness. Further evaluation is needed to determine the barriers in providing consistent feedback while in the ED in regard to ECGs.